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Biological Notes on *Nomia heteropoda* Say (Hymenoptera: Halictidae)[1]

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Abstract.—Nests of *Nomia heteropoda* Say are described and illustrated. Nests were constructed in sandy soil with short series of vertical cells (1–8) constructed in lateral branches off the main burrow. Soil depth where the first cells were found averaged 51.5 cm. No nest associates were found. Overwintering prepupae were reared to adults. A brief comparison of nesting habits of related species is included.

The largest species of North American Halictidae, *Nomia heteropoda* Say, is found throughout the southern part of the United States, with its distribution in the Mississippi Valley extending northward (Hurd et al., 1980). Because females prefer to nest in sand or sandy soil, populations are discontinuous throughout this range (Blair, 1935). Surprisingly, biological information on this large and showy species is scattered and scant. Most information is found in papers that deal either with the systematics of the group or with biologies of other species. For example, notes on nests discovered by Mickel and Dawson were recorded in Blair's (1935) systematic study. Cross and Bohart's (1960) description of a single nest of *N. heteropoda* is found in a study on the biology of *N. triangulifera* Vachal. A cell containing a pollen ball made by *N. heteropoda* was illustrated by Stephen, Bohart, and Torchio (1969). Hurd et al. (1980) listed unpublished references on the biology of this bee. The recent Hymenoptera Catalog (Krombein et al., 1979) listed host plants, but failed to cite any references about its nesting habits.

This paper presents additional observations on the nests, cells, and immature stages of *N. heteropoda* from a population nesting in sand dunes near Capital Reef National Monument in Utah.

NESTING SITE

A large aggregation of females (>100) was found nesting in a sand dune formed on the hills above the west bank of Sandy Creek, 5200′, SSE Notom, Garfield Co., Utah on September 16, 1983. The nesting site was in a 2500-m^2 blowout on the southern slope of the dune. The nests were made in the bottom and along the margins where the sides sloped at a 45-degree angle. The nests were characterized and easily found by the large accumulation of sand surrounding the entrance. The general area had abundant flowering plants of *Helianthus petiolaris* Nutt. which both sexes of *Nomia* visited.

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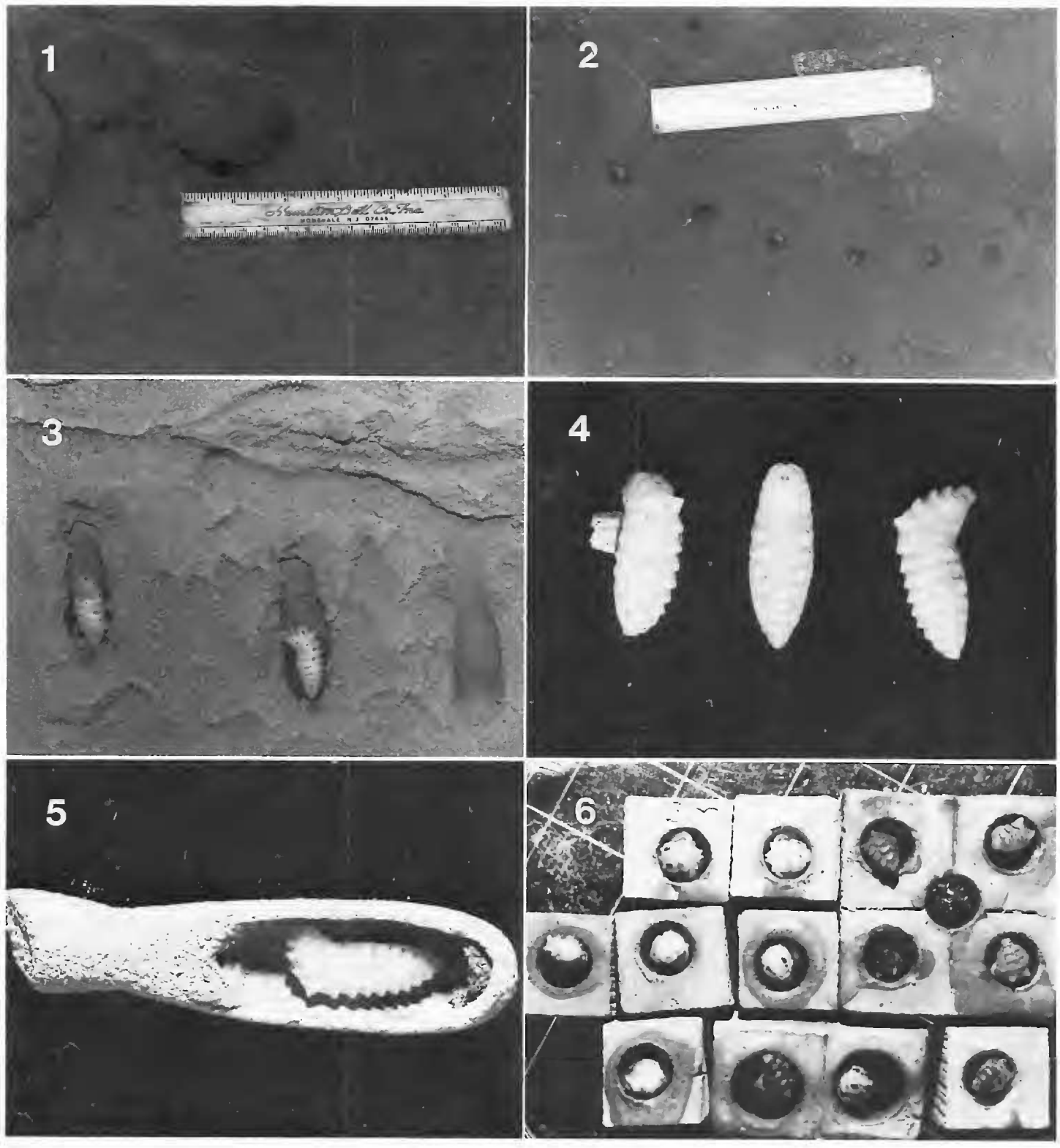

Figures 1–6. 1. Tumulus surrounding nest entrance. 2. Partially excavated cells made in a lateral branch as seen from above. 3. A 3-celled series illustrating nest architecture in lateral branches. The last cell is finished (waxed) but not provisioned. 4. Three views (dorsal, ventral, lateral) of overwintering prepupae. Note the characteristic and extended dorsal lobes. 5. A typical cell that was excavated, dried, and the loose sand removed. 6. Clay blocks with wax-lined holes used to rear *Nomia* larvae.

Nest Architecture

The entrance to each nest was surrounded by a large tumulus of sand. The tumuli varied in shape both because of the frequent winds in the area and the differences in ground slope. The tumuli were unusually large (about 10 cm wide by 5 cm high, Fig. 1) and visible from a considerable distance. Nest entrances were plugged when bees had ceased activities but were open when the bees were foraging. Often, nest entrances were at the side of the tumulus where a vestibular chamber was formed. These chambers appeared lined with some type of material because they held together when the tumulus was blown away. In some nests,

however, the entrance was exposed when even this vestibular chamber had been erased by the wind.

The initial slope of the 11–12 mm wide burrow varied from 45 degrees to vertical. The lower portion of the burrow was vertical in all nests and extended to an average depth of 71.8 cm ($n = 4$). In two nests, the burrow ended in a small chamber where a dead female was found. The main shaft did not appear to have a lining, although it was smooth. Cells were constructed in lateral burrows at a 60-degree angle downward from the main burrow. The average depth when branching began was 51.5 cm ($n = 9$). The direction of these lateral burrows was variable and not influenced by compass direction. There were series of cells in each lateral burrow, and more than one lateral in two nests. The lateral burrows were separated by as much as 10 cm between branching points along the main tunnel.

The first cell in a lateral was 4.5 to 6 cm from the main burrow. Subsequent cells in a series were 3 to 8.5 cm apart ($n = 24$) and progressively deeper (Fig. 2). The number of cells in a lateral varied from 1–9 and averaged 3.6 ($n = 13$). Individual cells were large and ranged from 33 to 45 mm long and from 10 to 12 mm wide. The top of the cell was narrowed subapically and formed a slight neck (Fig. 3). At the time of excavation (in early November), most cells contained overwintering prepupae (Fig. 4), but details of construction were evident in a few incomplete cells. The basal portion of the finished cell was lined by a coating of wax that extended up the side for 12 to 15 mm. No pollen provisions were found during our excavations; however, Stephen et al. (1969) illustrated a pollen ball made by this bee.

Some cells were cut from the surrounding soil and taken to the laboratory for further study. After the sand had dried, it could be removed away from the cell walls by gently rubbing it between the fingers. The resulting cells were elongate (Fig. 5) and firm. Apparently, the female incorporated some type of material with the sand during construction. The cell walls averaged 1–2 mm thick. The cells were closed at the top by a plug of sand formed in a concentric circle with the center left open. Above this plug, the entrance to the cell was filled with sand (Fig. 3).

Larval feces at the bottom of the cells were deposited in short links that were stacked on one another in a pile several mm high (Fig. 5).

No nest associates were found in this study and none were observed when the nests were active. In some cells, spores of an unknown fungus were found on the lining of the cell walls.

Some overwintering larvae were kept at 3°C from November until June and then transferred to wax-lined clay blocks that were moistened and placed in petri dishes (Fig. 6) and incubated at 30°C. Several larvae transformed to the pupal stage and later both males and females emerged. These voucher specimens were deposited in the collection at this Laboratory.

Discussion

The nesting biology and larval forms are similar to *N. triangulifera* (Cross and Bohart, 1960). The details of nest architecture were similar; for example, the arrangement of lateral burrows and placement of cells along the branches. More cells/laterals were found in nests of *N. triangulifera* than in nests of *N. heteropoda*.

Also, the short lateral pockets along the main shaft reported in *N. triangulifera* nests were not found in those of *N. heteropoda*. The pollen ball was similar in both species, but obviously that of *N. heteropoda* was much larger. The depth of the nests in this study were comparable, but other observers have reported *N. heteropoda* nests to be much deeper (Blair, 1935). Nest depth is likely influenced by soil moisture conditions and may be variable from site to site.

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